Sexual reproduction as a factor influencing population genetic structure in agamic complex of Hieracium subgenus Pilosella

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Introduction:
Hieracium subgen. Pilosella is one of the most complex groups in flowering plants. Its structure is strongly influenced by hybridisation, polyploidisation, and apomixis. Apomixis represents clonal reproduction through seeds, no genetic variation is generated among progeny. However apomixis usually coexists with some level of sexuality. Gametes fusing during sexual reproduction can be reduced or unreduced, and inter-cytotype or inter-specific crosses are frequent. Parthenogenetic development of reduced gametes (haploid parthenogenesis) is also possible. The principal task of our study is significance of variability generated by sexual reproduction and haploid parthenogenesis among progeny of apomicts in subgen. Pilosella.

Questions:
What kind of variability can be generated by sexual reproduction and haploid parthenogenesis among progeny of apomictic plants?
In what way does arising progeny impact subsequent development of population genetic structure?

Model system:
Hexaploid (6x) apomitic accession of H. bauhini and tetraploid (4x) sexual accession of H. pilosella were chosen for the study. All plants were collected near Valov (NW Bohemia) where natural hybridisations between H. bauhini and H. pilosella occur.

Results 1: What kind of variability can be generated by sexual reproduction and haploid parthenogenesis?
Variability arising among progeny of apomictic H. bauhini was investigated in crossing experiments. H. bauhini and H. pilosella were used as seed parent and pollen donor respectively. Origin of each offspring (fusion of reduced / unreduced gametes, haploid parthenogenesis or apomixis) was assessed on the base of its ploidy level (Tab. 1) using flow cytometry. Proportion of haploid parthenogenesis was tested also in emasculated plants of H. bauhini.

Results 2: In what way does arising progeny impact subsequent development of population genetic structure?
Natural populations represent only rarely simple crossing experiments consisting of parental species and F1 hybrids. Arising hybrids can also give rise to variability and contribute to formation of complex structure of natural populations. Therefore it is necessary to study processes occurring on population level and compare results from experiments with situation in nature.

Conclusions:
Although most of the progeny (94.23%) is produced asexually in apomictic H. bauhini, 4.31% of retained sexuality is sufficient to generate extensive variability. Three different classes of sexually derived progeny (5x, 7x, 8x) arose in crossing experiments. 1.28% of haploid parthenogenesis was detected in crossing experiments but only 0.31% in emasculated plants. Pollination seems to influence proportion of haploid parthenogenesis positively.

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